CLAIMS

1.   An isolated SSX-2 HLA class II-binding peptide comprising an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions, wherein the HLA class II-binding peptide does not include a full length SSX-2 protein.

2.   The isolated HLA class II-binding peptide of claim 1, wherein the isolated peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

3.   The isolated HLA class II-binding peptide of claim 2, wherein the isolated peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

4.   The isolated HLA class II-binding peptide of claim 3, wherein the isolated peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

5.   The isolated HLA class II-binding peptide of claim 1, wherein the isolated peptide comprises an endosomal targeting signal.

6.   The isolated HLA class II-binding peptide of claim 5, wherein the endosomal targeting signal comprises an endosomal targeting portion of human invariant chain Ii.

7.   The isolated HLA class II-binding peptide of claim 1, wherein the isolated peptide is non-hydrolyzable.

8.   The isolated HLA class II-binding peptide of claim 7, wherein the isolated peptide is selected from the group consisting of peptides comprising D-amino acids, peptides comprising a -psi[CH$_2$NH]-reduced amide peptide bond, peptides comprising a -psi[COCH$_2$]-ketomethylene peptide bond, peptides comprising a -psi[CH(CN)NH]-(cyanomethylene)amino peptide bond, peptides comprising a

-psi[CH₂CH(OH)]-hydroxyethylene peptide bond, peptides comprising a -psi[CH₂O]-peptide bond, and peptides comprising a -psi[CH₂S]-thiomethylene peptide bond.

9. A composition comprising an isolated HLA class I-binding peptide and an isolated SSX-2 HLA class II-binding peptide, wherein the isolated SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions, and wherein the HLA class II binding peptide does not include the full length SSX-2 protein.

10. The composition of claim 9, wherein the HLA class I-binding peptide and the SSX-2 HLA class II-binding peptide are combined as a polytope polypeptide.

11. The composition of claim 9, wherein the isolated SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

12. The composition of claim 11, wherein the isolated SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

13. The composition of claim 9, wherein the isolated SSX-2 HLA class II-binding peptide comprises an endosomal targeting signal.

14. The composition of claim 13, wherein the endosomal targeting signal comprises an endosomal targeting portion of human invariant chain Ii.

15. A composition comprising one or more of the isolated SSX-2 HLA class II-binding peptides of claim 1 complexed with one or more isolated HLA class II molecules.

16. The composition of claim 15, wherein the number of isolated SSX-2 HLA class II-binding peptides and the number of isolated HLA class II molecules are equal.

17. The method of claim 16, wherein the isolated SSX-2 HLA class II-binding peptides and the isolated HLA class II molecules are coupled as a tetrameric molecule of individual isolated SSX-2 HLA class II-binding peptides bound to individual isolated HLA class II molecules.

18. The method of claim 17, wherein the HLA class II molecules are DR molecules.

19. An isolated nucleic acid molecule encoding a peptide selected from the group consisting of the peptides of any of claims 1-4, wherein the nucleic acid molecule does not encode a full length SSX-2 protein.

20. An expression vector comprising the isolated nucleic acid molecule of claim 19 operably linked to a promoter.

21. The expression vector of claim 20, wherein the nucleic acid molecule comprises a nucleotide sequence selected from the group consisting of SEQ ID NOs:73-78.

22. The expression vector of claim 20, wherein the nucleic acid molecule comprises a nucleotide sequence selected from the group consisting of SEQ ID NO:46 and SEQ ID NO:47.

23. The expression vector of claims 21 or 22 further comprising a nucleic acid molecule that encodes an HLA-DR molecule.

24 A host cell transfected or transformed with an expression vector selected from the group consisting of the expression vector of claim 21 and the expression vector of claim 22.

25. A host cell transfected or transformed with the expression vector of claim 23.

26. A host cell transfected or transformed with an expression vector selected from the group of the expression vectors of claim 21 and the expression vector of claim 22, wherein

the host cell expresses an HLA-DR molecule.

27.   A method for selectively enriching a population of T lymphocytes with CD4$^+$ T lymphocytes specific for a SSX-2 HLA class II-binding peptide comprising:

        contacting an isolated population of T lymphocytes with an agent presenting a complex of the SSX-2 HLA class II-binding peptide and an HLA class II molecule in an amount sufficient to selectively enrich the isolated population of T lymphocytes with the CD4$^+$ T lymphocytes,

        wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

28.   The method of claim 27 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

29.   The method of claim 28 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

30.   The method of claim 29 wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

31.   The method of claim 27 wherein the HLA class II molecule is an HLA-DR molecule.

32.   The method of claim 27, wherein the SSX-2 HLA class II binding peptide comprises an endosomal targeting portion of human invariant chain Ii.

33.   A method for diagnosing a cancer characterized by expression of SSX-2 HLA-class II-binding peptide comprising:

        contacting a biological sample isolated from a subject with an agent that is specific for

the SSX-2 HLA class II-binding peptide, and

determining the interaction between the agent and the SSX-2 HLA class II-binding peptide as a determination of the disorder, wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

34.   The method of claim 33 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

35.   The method of claim 34 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

36.   The method of claim 35 wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

37.   The method of claim 33, wherein the agent is an antibody or an antigen binding fragment thereof.

38.   A method for diagnosing a cancer characterized by expression of a SSX-2 HLA class II-binding peptide which forms a complex with an HLA class II molecule, comprising:

contacting a biological sample isolated from a subject with an agent that binds the complex, and

determining binding between the complex and the agent as a determination of the disorder,

wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

39.   The method of claim 38 wherein the SSX-2 HLA class II-binding peptide comprises

an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

40.   The method of claim 39 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

41.   The method of claim 40, wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

42.   A method for treating a subject having a cancer characterized by expression of SSX-2 HLA class II-binding peptide comprising:
        administering to the subject an amount of a SSX-2 HLA class II-binding peptide effective to ameliorate the disorder, wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

43.   The method of claim 42 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

44.   The method of claim 43 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

45.   The method of claim 44, wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

46.   The method of claim 42, wherein the SSX-2 HLA class II binding peptide comprises an endosomal targeting signal.

47.   The method of claim 46, wherein the endosomal targeting signal comprises an endosomal targeting portion of human invariant chain Ii.

48.   A method for treating a subject having a cancer characterized by expression of SSX-2 HLA class II-binding peptide comprising:
        administering to the subject an amount of a HLA class I-binding peptide and an amount of a SSX-2 HLA class II-binding peptide effective to ameliorate the disorder,
        wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

49.   The method of claim 48 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

50.   The method of claim 49 wherein the SSX-2 HLA class II-binding peptide consists an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

51.   The method of claim 50, wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

52.   The method of claim 48, wherein the HLA class I-binding peptide and the SSX-2 HLA class II-binding peptide are combined as a polytope polypeptide.

53.   The method of claim 48, wherein the HLA class I-binding peptide is a SSX-2 HLA class I-binding peptide.

54.   The method of claim 48, wherein the SSX-2 HLA class II binding peptide comprises an endosomal targeting signal.

55. The method of claim 54, wherein the endosomal targeting signal comprises an endosomal targeting portion of human invariant chain Ii.

56. A method for treating a subject having a cancer characterized by expression of SSX-2, comprising:

administering to the subject an amount of a SSX-2 HLA class II-binding peptide effective to ameliorate the cancer,

wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

57. The method of claim 56 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

58. The method of claim 57 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

59. The method of claim 58, wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

60. The method of claim 56, wherein the SSX-2 HLA class II binding peptide comprises an endosomal targeting signal.

61. The method of claim 60, wherein the endosomal targeting signal comprises an endosomal targeting portion of human invariant chain Ii.

62. A method for treating a subject having a cancer characterized by expression of SSX-2 HLA class II-binding peptide comprising:

administering to the subject an amount of autologous CD4$^+$ T lymphocytes sufficient

to ameliorate the disorder, wherein the CD4$^+$ T lymphocytes are specific for complexes of an HLA class II molecule and a SSX-2 HLA class II-binding peptide,

wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25, or a functional variant thereof comprising 1-5 amino acid substitutions.

63.   The method of claim 62 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

64.   The method of claim 63 wherein the SSX-2 HLA class II-binding peptide consists an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

65.   The method of claim 64, wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

66.   A method for identifying functional variants of a SSX-2 HLA class II-binding peptide, comprising

selecting a SSX-2 HLA class II-binding peptide which comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42, an HLA class II-binding molecule which binds the SSX-2 HLA class II-binding peptide, and a T cell which is stimulated by the SSX-2 HLA class II-binding peptide presented by the HLA class II-binding molecule;

mutating a first amino acid residue of the SSX-2 HLA class II-binding peptide to prepare a variant peptide; and

determining the binding of the variant peptide to HLA class II-binding molecule and the stimulation of the T cell, wherein binding of the variant peptide to the HLA class II-binding molecule and stimulation of the T cell by the variant peptide presented by the HLA class II-binding molecule indicates that the variant peptide is a functional variant.

67.   The method of claim 66, further comprising the step of comparing the stimulation of the T cell by the SSX-2 HLA class II-binding peptide and the stimulation of the T cell by the functional variant as a determination of the effectiveness of the stimulation of the T cell by the functional variant.

5

68.   An isolated polypeptide that binds selectively a peptide of claim 1, provided that the isolated polypeptide is not an HLA class II molecule.

69.   An isolated polypeptide that binds selectively a complex of a peptide of claim 1 and

10   an HLA class II molecule provided that the isolated polypeptide is not a T cell receptor.

70.   The isolated peptide of claim 68 or claim 69, wherein the isolated polypeptide is an antibody.

15   71.   The antibody of claim 70, wherein the antibody is a monoclonal antibody.

72.   The antibody of claim 71, wherein the monoclonal antibody is a human antibody, a humanized antibody, a chimeric antibody or a single chain antibody.

20   73.   The isolated peptide of claim 68 or claim 69, wherein the isolated polypeptide is an antibody fragment selected from the group consisting of a Fab fragment, a $F(ab)_2$ fragment, a Fv fragment or a fragment including a CDR3 region selective for a SSX-2 HLA class II-binding peptide.

25   74.   An isolated $CD4^+$ T lymphocyte that selectively binds a complex of an HLA class II molecule and a SSX-2 HLA class II-binding peptide,

        wherein the HLA class II molecule is an HLA-DR molecule and wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25 or a functional variant thereof.

30

75.   The isolated $CD4^+$ T lymphocyte of claim 74 wherein the SSX-2 HLA class II-binding

peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

76.   The isolated CD4$^+$ T lymphocyte of claim 75 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

77.   The isolated CD4$^+$ T lymphocyte of claim 76 wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.

78.   An isolated antigen presenting cell which comprises a complex of an HLA class II molecule and a SSX-2 HLA class II-binding peptide,

        wherein the HLA class II molecule is an HLA-DR molecule and wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence set forth as SEQ ID NO:25 or a functional variant thereof.

79.   The isolated antigen presenting cell of claim 78 wherein the SSX-2 HLA class II-binding peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24 and SEQ ID NO:42.

80.   The isolated antigen presenting cell of claim 79 wherein the SSX-2 HLA class II-binding peptide consists of an amino acid sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:22, SEQ ID NO:23, SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:42.

81.   The isolated antigen presenting cell of claim 80 wherein the SSX-2 HLA class II-binding peptide consists of the amino acid sequence set forth as SEQ ID NO:25 or SEQ ID NO:42.